

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 11210

Box No. I	TITLE OF INVENTION A drying device	
Box No. II	APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.) PLESTENJAK Jože Vrhovci, c. VIII/7 1000 Ljubljana Slovenia (SI)		<input checked="" type="checkbox"/> This person is also inventor. Telephone No. Facsimile No. Teleprinter No.
State (i.e. country) of nationality: SI		State (i.e. country) of residence: SI
This person is applicant for the purposes of: <input checked="" type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
Box No. III	FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.) 		This person is: <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)
State (i.e. country) of nationality:		State (i.e. country) of residence:
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.		
Box No. IV	AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) BORŠTAR Dušan Nova ulica 11 1230 Domžale Slovenia (SI)		Telephone No. +386 61 713 647 Facsimile No. +386 61 719 195 Teleprinter No.
<input type="checkbox"/> Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.		

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☒ AP ARIPO Patent: GH Ghana, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> AT Austria ..and utility model.. | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> CZ Czech Republic and utility model | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> DE Germany and utility model | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> DK Denmark and utility model | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> EE Estonia and utility model | <input checked="" type="checkbox"/> SK Slovakia and utility model |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> FI Finland and utility model | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | |
| <input checked="" type="checkbox"/> KZ Kazakstan | |
| <input checked="" type="checkbox"/> LC Saint Lucia | |
| <input checked="" type="checkbox"/> LK Sri Lanka | |
| <input checked="" type="checkbox"/> LR Liberia | |
| <input checked="" type="checkbox"/> LS Lesotho | |
| <input checked="" type="checkbox"/> LT Lithuania | |
| <input checked="" type="checkbox"/> LU Luxembourg | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☒ GW Guinea-Bissau
- ☒ GM Gambia
- ☐
- ☐
- ☐

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM				Further priority claims are indicated in the Supplemental Box <input type="checkbox"/>	
The priority of the following earlier application(s) is hereby claimed:					
Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)		
item (1) Slovenia (SI)	04 November 1997 (04/11/1997)	P-9700284			
item (2) Slovenia (SI)	27 March 1998 (27/03/1998)	P-9800094			
item (3)					
Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):					
<input checked="" type="checkbox"/> The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): (1) and (2)					
Box No. VII INTERNATIONAL SEARCHING AUTHORITY					
Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA /					
Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request. Country (or regional Office): Date (day/month/year): Number:					
Box No. VIII CHECK LIST					
This international application contains the following number of sheets:			This international application is accompanied by the item(s) marked below:		
1. request : 03 sheets			1. <input checked="" type="checkbox"/> separate signed power of attorney		
2. description : 14 sheets			5. <input checked="" type="checkbox"/> fee calculation sheet		
3. claims : 04 sheets			2. <input type="checkbox"/> copy of general power of attorney		
4. abstract : 01 sheets			6. <input type="checkbox"/> separate indications concerning deposited microorganisms		
5. drawings : 04 sheets			3. <input type="checkbox"/> statement explaining lack of signature		
Total : 26 sheets			7. <input type="checkbox"/> nucleotide and/or amino acid sequence listing (diskette)		
			4. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):		
			8. <input checked="" type="checkbox"/> other (specify): Request for reduction of the EPO fees		
Figure No. 04 of the drawings (if any) should accompany the abstract when it is published.					
Box No. IX SIGNATURE OF APPLICANT OR AGENT					
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (If such capacity is not obvious from reading the request).					
BORŠTAR Dušan /agent/ Y					

For receiving Office use only	
1. Date of actual receipt of the purported international application:	2. Drawings: <input type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	
4. Date of timely receipt of the required corrections under PCT Article 11(2):	
5. International Searching Authority specified by the applicant: ISA /	
6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	

For International Bureau use only
Date of receipt of the record copy by the International Bureau:

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 11210	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/SI 98/ 00008	International filing date (day/month/year) 30/03/1998	(Earliest) Priority Date (day/month/year) 04/11/1997
Applicant PLESTENJAK, Joze		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a nucleotide and/or amino acid sequence listing and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ Transcribed by this Authority
4. With regard to the title,
 - ☒ the text is approved as submitted by the applicant
 - ☐ the text has been established by this Authority to read as follows:
5. With regard to the abstract,
 - ☒ the text is approved as submitted by the applicant
 - ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
Figure No. 4
 - ☒ as suggested by the applicant.
 - ☐ because the applicant failed to suggest a figure.
 - ☐ because this figure better characterizes the invention.
 - ☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/SI 98/00008

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 F26B21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 6 F26B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 644 855 A (C.E.A.F.) 28 September 1990 see the whole document ---	1,5,9,10
A	CH 585 379 A (FELBER) 28 February 1977 see the whole document ---	1,9,10
A	EP 0 170 648 A (LEISSER) 5 February 1986 cited in the application see the whole document ---	1,9
A	DE 24 41 855 A (JÖRGENSEN) 11 March 1976 see the whole document ---	1,2,4,5
A	US 3 566 480 A (JOHNSTONE) 2 March 1971 see the whole document ---	1,4,5
	--- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

16 June 1998

Date of mailing of the international search report

25/06/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax: (+31-70) 340-3016

Authorized officer

Silvis, H

INTERNATIONAL SEARCH REPORT

International Application No

PCT/SI 98/00008

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 370 422 A (REED) 27 February 1945 see the whole document ---	1,2,4
A	US 4 955 146 A (BOLLINGER) 11 September 1990 see the whole document ---	1,2,4
A	US RE28226 E (COOK) 5 November 1974 see the whole document ---	1,2
A	US RE31633 E (LEWIS) 24 July 1984 ---	
A	FR 1 247 859 A (AKTIEBOLAGET SVENSKA FLÄKTFABRIKEN) 24 February 1961 -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/SI 98/00008

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
FR 2644855	A	28-09-1990	NONE		
CH 585379	A	28-02-1977	NONE		
EP 170648	A	05-02-1986	AT	385840 B	25-05-1988
			CS	8505498 A	12-02-1990
			DE	3564736 A	06-10-1988
DE 2441855	A	11-03-1976	NONE		
US 3566480	A	02-03-1971	DE	1778454 A	29-07-1971
			FR	1560987 A	21-03-1969
			GB	1229987 A	28-04-1971
			NL	6806073 A	04-11-1968
US 2370422	A	27-02-1945	NONE		
US 4955146	A	11-09-1990	NONE		
US RE28226	E	05-11-1974	US	3659352 A	02-05-1972
US RE31633	E	24-07-1984	US	4250629 A	17-02-1981
			CA	1122404 A	27-04-1982
FR 1247859	A	24-02-1961	NONE		

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

PIPAN, Marjan
Kotnikova 5
1000 Ljubljana
SLOVENIE

Date of mailing (day/month/year)

17 June 1999 (17.06.99)

Applicant's or agent's file reference

11210

International application No.

PCT/SI98/00008

International filing date (day/month/year)

30 March 1998 (30.03.98)

IMPORTANT NOTIFICATION

1. The following indications appeared on record concerning:

☐

the applicant

☐

the inventor

☒

the agent

☐

the common representative

Name and Address

State of Nationality

State of Residence

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒

the person

☒

the name

☒

the address

☐

the nationality

☐

the residence

Name and Address

PIPAN, Marjan
Kotnikova 5
1000 Ljubljana
Slovenia

State of Nationality

State of Residence

Telephone No.

+386 61 131 90 44

Facsimile No.

+386 61 131 41 28

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒

the receiving Office

☐

the International Searching Authority

☒

the International Preliminary Examining Authority

☐

the designated Offices concerned

☒

the elected Offices concerned

☐

other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

N. Lindner

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

PLESTENJAK, Joz²e
Vrhovci, c. VIII/7
1000 Ljubljana
SLOVENIE

Date of mailing (day/month/year) 14 May 1999 (14.05.99)		IMPORTANT NOTICE	
Applicant's or agent's file reference 11210			
International application No. PCT/SI98/00008	International filing date (day/month/year) 30 March 1998 (30.03.98)	Priority date (day/month/year) 04 November 1997 (04.11.97)	
Applicant PLESTENJAK, Joz ² e			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,EP,IL,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CU,CZ,DE,DK,EA,EE,ES,FI,GB,GE,GH,GM,GW,HU,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SK,SL,TJ,TM,TR,TT,UA,UG,UZ,VN,YU,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 14 May 1999 (14.05.99) under No. WO 99/23430

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 18 June 1999 (18.06.99)	
International application No. PCT/SI98/00008	Applicant's or agent's file reference 11210
International filing date (day/month/year) 30 March 1998 (30.03.98)	Priority date (day/month/year) 04 November 1997 (04.11.97)
Applicant PLESTENJAK, Joz [^] e	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
01 June 1999 (01.06.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

N. Lindner

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY**PCT****INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION**

(PCT Rule 61.3)

From the INTERNATIONAL BUREAU

To:

PLESTENJAK, Joz^o 28
Vrhovci, c. VIII/7
1000 Ljubljana
SLOVENIE

Date of mailing (day/month/year)
18 June 1999 (18.06.99)

Applicant's or agent's file reference
11210

IMPORTANT INFORMATION

International application No.
PCT/SI98/00008

International filing date (day/month/year)
30 March 1998 (30.03.98)

Priority date (day/month/year)
04 November 1997 (04.11.97)

Applicant

PLESTENJAK, Joz^o 28

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

AP : GH, GM, KE, LS, MW, SD, SZ, UG, ZW

EP : AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

National : AU, BG, BR, CA, CN, CZ, DE, GB, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

OA : BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG

National : AL, AM, AT, AZ, BA, BB, BY, CH, CU, DK, EE, ES, FI, GE, GH, GM, GW, HU, IS, KE, KG,
KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MW, MX, PT, SD, SG, SL, TJ, TM, TR, TT, UA, UG, UZ,
VN, YU, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 38(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer:

N. Lindor

Facsimile No. (41-22) 740.14.35

Telephone No. (41-22) 338.83.38

Form PCT/IB/332 (September 1997)

2680856

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 11210	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SI98/00008	International filing date (day/month/year) 30/03/1998	Priority date (day/month/year) 04/11/1997
International Patent Classification (IPC) or national classification and IPC F26B21/02		
Applicant PLESTENJAK, Joze		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 01/06/1999	Date of completion of this report 21.01.2000
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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/SI98/00008

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-14 as originally filed

Claims, No.:

1-20 as originally filed

Drawings, sheets:

1/4-4/4 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/SI98/00008

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-20
	No:	Claims	1
Inventive step (IS)	Yes:	Claims	4, 2,3,5-20
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Ad Item V - Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability / Citations and explanations supporting such statement

1. Claim 1

The most relevant prior art appears to be document FR-A-26 44 855 or document DE-A-24 41 855. These documents disclose a drying device, comprising besides the features of the first part of claim 1 also the remaining features, that an air deflector is placed above the kiln volume in the kiln compartment extending from the heat condensation device over the kiln volume and forming with the top of the kiln compartment a tunnel shaped air shaft in which an appropriate ventilation assembly is placed and whereby the heat condensation device ends in a certain distance from the one side wall of the kiln compartment and extends close to the bottom of the kiln compartment.

Therefore, the present application does not satisfy the criterion set forth in Article 33(2) PCT because the subject-matter of Claim 1 is not new in respect of prior art as defined in the regulations (Rule 64(1)-(3) PCT).

2. Claim 4

The arrangement defined in claim 4, which depends upon claim 1, additionally provides in the wall opposite to the wall adjacent to the condensation device, in which may also be arranged a door, a system vent, whereby that said air deflector extends in a direction towards the wall with the system vent and forms an air passage at its end with the system vent, allowing in the closed position of the system vent a circulation of the drying air through the tunnel, into the kiln volume, to the condensation device and back into the tunnel and in the open position of the system vent the discharge of the drying air from the tunnel directly to the atmosphere. The combination of claims 1 and 4 apparently provides a simple arrangement for either circulating the drying air in the drying device or discharging it to the atmosphere.

It is acknowledged that such an arrangement is neither known from nor rendered

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/SI98/00008

obvious by the available prior art. It is also credible that such an arrangement provides a higher drying efficiency compared to the solutions suggested in the prior art.

The combination of the subject-matter of claims 1 and 4 would therefore appear to meet the criterion set forth in Article 33 (3) PCT.

3. Claims 2, 3 and 5 to 20

Dependent claims 2, 3 and 5 to 20, referring back to a combination of claims 1 and 4, would contain modifications of the inventive idea embodied in the combination of claims 1 and 4 and would also appear to meet the requirements of Articles 33 (2) and (3) PCT.

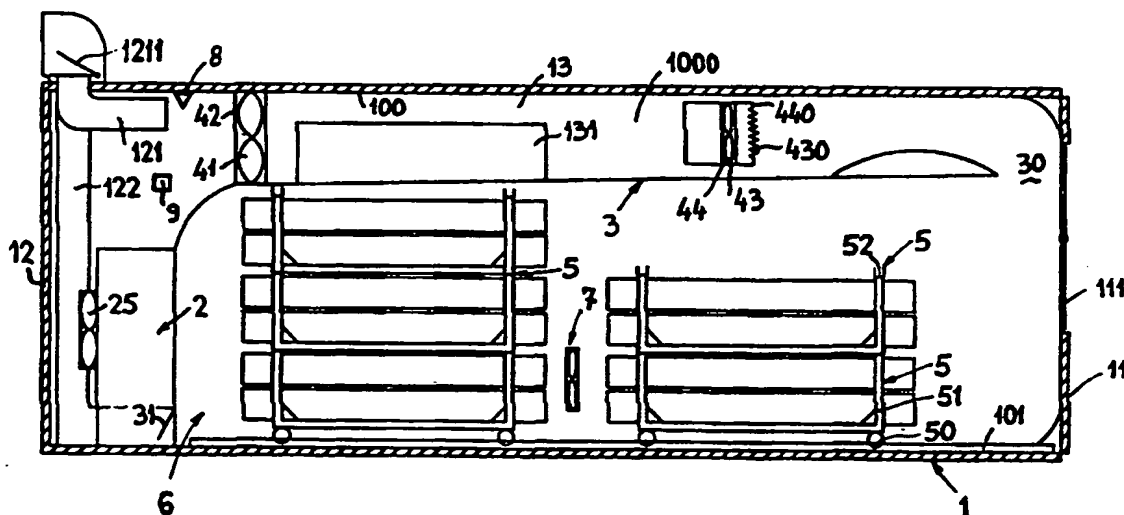
Ad Item VII - Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents FR-A-26 44 855 and DE-A-24 41 855 are not mentioned in the description, nor are these documents identified therein.
2. The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : F26B 21/02		A1	(11) International Publication Number: WO 99/23430
			(43) International Publication Date: 14 May 1999 (14.05.99)
(21) International Application Number: PCT/SI98/00008 (22) International Filing Date: 30 March 1998 (30.03.98) (30) Priority Data: P-9700284 4 November 1997 (04.11.97) SI P-9800094 27 March 1998 (27.03.98) SI (71)(72) Applicant and Inventor: PLESTENJAK, Jože [SI/SI]; Vrhovci, c. VIII/7, 1000 Ljubljana (SI).		(81) Designated States: AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GE, GH, GM, GW, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report.	

(54) Title: A DRYING DEVICE



(57) Abstract

The aim of the present invention is to create an efficient energy rational and consequently economical drying device, particularly the drying compartment unit, which could be used for drying processes for all wood products regardless to dimensions, with the ability of a controlled process of humid transfer from wood in specific atmospheric conditions by travel air, to achieve improvement of quality of drying wood, which include known drying effects, by the construction of the kiln volume proportional to fulfil dimensional and transport standards of transport containers, thus making possible the drying device being exploited by end user as a stationary or mobile type.

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A drying device

The invention relates to a drying device, particularly for drying wood and semi-products of wood like veneer or sawn wood as well as other products.

A growing tree as a woody perennial plant contains relatively huge amounts of moisture content varying from one kind to another which stays in the tree after being cut down. As it is known wood contains capillaries in cells that contain free liquid and absorbed molecules of water called moisture content which must be lowered to a certain level to satisfy needs of industrial use. For that reason, wood has to be properly treated, namely dried to a certain value of acceptable end moisture distribution content in a way to prevent occurring of all kinds of drying defects. The drying process is a major factor in economic terms.

Wood could be dried under natural circumstances in the open – air drying if wood climate relation conditions are good enough and consequently generating acceptable quality of dried sawn wood. It has to be considered that air drying of wood is a long term process which could extend into years. When finally wood is dried it needs proper storage conditions that include natural circulation of dry warm air and other terms of planning. It has to be considered that absorbed water in the wood can emerge and evaporate with the help of surrounding air flow only in case if the surface is not covered by rain fall water, snow or other substances. Influencing on air drying technology

by restacking with ventilation abilities do help in minor values with the constant risk of wood being attacked by mould, microorganism, fungi, insects including uneven drying that can worsen quality of wood expressed with other terms concerning its quality. There is always a potential problem of shape deformations that can emerge because of natural air – drying unpredictable situations that cannot be prevented by any preventive process control technology or monitoring of any kind. Moisture distribution content in wood is by using technology of drying by air after a certain period of time depending on climate conditions what means that time variation is present in planning emerging other problems usually leading to higher costs, too much rejections of quality assurance and alike. On the other hand there are also some other effects of such a technology like low energy consumption, huge drying areas, storage departments, safety precautions. There were some experiments executed to shorten air - drying process by engaging axial fans, but there are too many other parameters like relative humidity and others on which axial fans cannot influence.

With the intention to reduce drying time in the aspect of cost, quality and time were developed drying devices of different kinds, which can be distinguished by a technological approach in a following manner: The first type is a compartment type and tunnel kiln type. Both known types of drying devices can be characterized as stationary types. By the first type of drying devices the wood is placed in available compartment which has the ability of generating different physical conditions like: temperature, humidity, air flow capacity and alike, with the intention of proceeding of the drying process. By the second type of drying devices the wood is transported with the help of horizontal transport unit through the drying device where it is sequentially processed under different physical conditions, mainly for the purposes of gradually executing the drying process. Compartment type drying devices are cheaper, but with lower production rate in comparison with the tunnel kiln type drying devices, where investment costs are relatively high.

The already known types of drying devices have certain disadvantages which will be explained in details as follows including the decisions of great investment cost and setting up difficulties in aspect of economy factors.

The technology processes used nowadays by drying the wood are performed either by low temperatures between 15 and 45°C or by medium temperatures between 45 and 90°C or also by high temperatures between 90 and 130°C with the possibility of achieving above specified temperatures e.g. by means dielectrical, convectional, conduction or radiation principles.

By certain types of drying devices the wood is put into compartment by means of suitable transport carriages. With the ventilators placed on the ceiling or rarely on other locations an air flow is created which is in some cases blown transversely, yet by others the air flow is lead horizontaly and transversely and still in other versions the air is lead longitudinally.

By all these known drying devices the transport units are constructed in a manner and with such dimensions that enable loading as great quantities of wood as possible in the kiln volume. The wood is stacked by along ventilation in a way that air flow is possible at least in one horizontal plane. A certain compromise has to be achieved with the consideration of dimensions of the air gap that is neccessary for air flow and the amount of wood in the kiln. The hot air is then blown through the air gaps in order to fasten up the intensity of drying. When the hot air gets in contact with the wood containing high moisture level it absorbs it to its highest possible value, what causes enabling of absorption of moisture, that is still present deeper in the pile. Consequently that means that ventilators create enough strong air flow yet with the highest moisture level possible what means only a lot of waste of energy. Because of high moisture level in the air it is very likely that it condenses on cooler places such as walls and other equipment causing damage. The condensed liquid that stays in the kiln volume effects harmfull on it as well as to the drying process.

As noted in the patent application EP 0 170 648 A1 which is intended to execute one of the latest drying technologies the compartment has warm-insulated walls. The sawn wood is being stacked by longitudinal ventilation in the kiln volume. In the drying device there is installed a ventilator which enables air flow passing through a heating register then continuing on through stacked wood to the cooling register where the air flow is led in a way of repeating the same loop. In the area of heating register the air is warmed up then as passing through the stacked wood it picks up moisture which is then released by passing through the cooling register to the warming register. Such a combination is likely to create condensate if fresh sawn wood is processed but is quite suitable for wood with low moisture volume - the final touch - before being used up by industry.

If desired that by means of saturated air generated by drying process of stacked wood as highest as possible quantity of moisture should be departed from compartment, the air must be heated. The disposal of great amounts of saturated air is combined with great losses of heat used before as heating air. Energy yield by using this technology of drying wood is low.

Except of the above mentioned drying technologies also a vacuum drying technology is described in the PCT/DK87/00012 and WO 87/04779, where e.g. intensity of drying process could be monitored in order to avoid drying defects. The devices with applied vacuum technology are very sensitive in maintaining proper vacuum conditions and are more suitable for drying processes for wood containing lower values of moisture what means that other drying technology for eliminating the majority of moisture has to be used therefore.

By all these known solutions it can be summarized that all of them have certain imperfections, e.g. relatively low energy yield being unacceptable for

global economy, or high requirements in respect of the space consumption, highly dependence on power sources, a high probability of drying defects, very small or no adaptable abilities and are moreover built as a stationary type with drying capacities that dictate the amounts of drying wood and technology.

According to the invention, the drying unit is provided by an aerated housing, the inner area of which is connected by the circumferential area by means of exhausting conduits and aerating conduits. Thus, in accordance with the principals of the invention, the new drying device is created on the basis of many ventilation air systems containing different type of airflow intake as well as disposal air possibilities that are fixed to the drying device. Such a device is equipped by a heat condensation device containing a heating unit, a condensation unit and a ventilator. The drying device has a drying kiln in which with the help of transporting carriage is placed wood intended to be dried. The drying process is executed in the drying kiln by enforced circulating air. At least one wall of the kiln compartment is equipped by suitable air shafts for aerating or exhausting functions as an integrated unit of the drying device including the system vent which has the function of air pre-orientation in any time required during the drying process in coinsistence with air deflector placed above the loading volume integrated in the kiln compartment by the heat condensation unit, which extends from the opposite side of the drying compartment and ends at the bottom of the kiln compartment. The air deflector by the heat condensation device has mounted at least one vent, which could be self-adjustable and an integrated unit consisting of a partition wall and the top of kiln volume, which in combination with the top of the kiln compartment presents a tunnel-shaped air shaft in which the ventilation system is placed. The whole above mentioned section is called an air deflector. The already mentioned air shafts start on the micro climate vent mounted on the top of the kiln compartment, then they are lead mainly along the side wall and are ended within the space of the kiln volume.

In the kiln volume there is arranged at least one ventilation unit with the ability of angular adjustment with the possibility of positioning it either in the on- or in the off-state function. With the microclimate went in closed position connected with the air shafts, ranging from the top of the kiln compartment ending in the kiln volume are generated conditions for creating an internal air circulation, but in open position the internal circulation gets in contact again with the help of the shafts with external atmosphere with parallel air flow of moistured air blown out of the kiln volume in the atmosphere and sucked in fresh dry air in the tunnel shaped air shaft due to the pressure difference. In the tunnel-shaped air shaft is recommended an installation of heating elements.

In accordance with the invention is the unit for stacking wood or other products intended for drying also equipped with accessories that enable vertical and horizontal stacking and longitudinal ventilation. The accessories also enable vertical positioning of dominant surfaces of the drying wood. The distance holders that enable stacking of wood are placed vertically in relationship to each another and are shorter than the vertical supports of the unit. The said units can be mounted one on each other. The bottom carriage can be equipped by transport wheels. In accordance with the present solution in the kiln compartment space close to the micro climate vent is placed an UV-emitter meant for emitting ultra-violet rays to the moisture contained in the air with the intention of eliminating the possibility of development culters like mould, fungi and other microorganismus.

In accordance with the principals of the invention is the new drying device equipped with magnets assembled in the kiln compartment in bipolar arrangement what means that magnetization treatment influences on all the processes – chemical, physical and biological.

According to the invention, the drying device also comprises a heating condensation device with a ventilator assembled in the opening of partition

wall. The heating condensation device is designed in a way of irregular medium flow linking to increase condensation effect as well as heating emission.

Now, the invention will be described in more detail on the basis of an embodiment as shown in the accompanied drawings, where

Fig. 1 is a longitudinal cross-section of the drying device in a vertical plane;

Fig. 2 is a transversal cross-section of the device in the vertical plane;

Fig. 3 is a longitudinal cross-section of the device in a horizontal plane;

Fig. 4 is a longitudinal cross-section of the device in the vertical plane, however during its operation mode comprising combination of dehumidification drying and convection drying with the wood stacked to enable ventilation in the longitudinal direction;

Fig. 5 is a transversal cross-section of the device according to Fig. 5 in its vertical plane;

Fig. 6 is a longitudinal cross-section of the device according to Fig. 1 - 3, however during its further operation mode suitable for accelerated process of natural air drying, again with the stacked wood;

Fig. 7 is a transversal cross-section of the drying device according to Fig. 5;

Fig. 8 shows a condensation unit of the device according to the invention; and

Fig. 9 shows a unit for stacking wood also comprised by the device according to the invention.

A drying device shown in Fig. 1 - 3 is in generally designed for drying wood and other materials with the kiln compartment 1 constructed as to fulfill standards and other requirements known in the field of transport where standard containers are used for all known transport possibilities. The proportions of the kiln compartment 1 have certain advantages comparing with all till now known drying devices as well as certain limitations, which may be however overcome by the solution according to the invention. In such a

manner it is possible to exploit the drying device by the user either e.g. as a stationary or a mobile device with extremely quick and simple installation to appropriate location.

At least one of the side walls 11, 12, 13, 14 of the kiln compartment 1, namely in this case the longitudinal wall 13, is equipped by a suitable door 131, allowing e.g. to enter the kiln compartment 1 and being e.g. intended for personal access. On the other hand, by the shown embodiment the wall 11 is equipped by a lifting loading door, in which is in this case fixed at least one system vent 111, which is otherwise arranged in the area of the said wall 11. In accordance with the general idea of the invention will the role of the system vent 111 be explained in more detail as follows.

On the opposite side of the kiln compartment 1, namely on the top of the wall 12, there are fixed suitable integrated micro climate vents 1211 equipped with appropriate exhaust funnels 1210, 1220 of the aerating respectively exhausting air shafts 121, 122 as a way by which the interior of the kiln compartment is connected with the external atmosphere. With the help of the micro climate vent 1211 the air shaft 121 connects or disconnects the exterior atmosphere and the interior area 10' near the top 100 of the kiln compartment 1; analogous the air shaft 122 is connected in the same way with the help of appropriate micro climate vent 1221 to external atmosphere and the interior space 10" near the bottom 101 of the kiln compartment 1 in a certain distance with respect to the back wall 12, where is also placed a heat condensation device 2. By using the micro climate vent 1211 great advantages are obtained in cases when performing the drying program is in automatic mode.

The heating condensation device 2 is schematically shown in the Fig. 8 and consists of the following parts: a housing 20 equipped with an outlet 201 for condensate, a condensation unit 21, a heating unit 22, a compressor 23 and a throttle, which are mutually connected in appropriate circuit 26 together with

condensation unit 21 and heating unit 22 and a ventilator 25 which enables an air flow from condensation unit 21 to heating unit 22 continuing on in the same direction towards other interior areas of the kiln compartment 1. Such a heating condensation device 2 enables that warm moistured air with the help of condensation unit 21 reduces the amount of moisture in it formed as condensate flowing out trough a escape - pipe 201. The air is warmed up in the heating unit 22 for approximately 2°C with respect to temperature of the air entering the kiln volume from its circumferential area.

In the kiln compartment 1 is assembled the top of the kiln volume, partition wall with an air deflector 3 close to the heat condensation unit 2 in a certain distance from the side wall 12 which is connected with the bottom area 101 of the kiln compartment 1. The air shafts 121, 122, and heat condensation device 2 are placed between the side wall 12 and the top area 100 with the air deflector 3 placed under the top area 100 of the kiln compartment 1 in a certain distance from the top area 100 extending to the door 11 with the system shaft 111 of the kiln compartment 1. The top area 100 with air deflector 3 is positioned in relationship to top 100 and door 11 with the system shaft 111 of kiln compartment 1 in a way to close the passage 30 between the top 100, side wall 112 and the top with air deflector 3. The system shaft 111 can be led in automatic mode.

The shape and the position of the air deflector 3 placed under the top area 100 enable forming a tunnel shaped air shaft 1000, in which is placed the ventilation unit 40 comprising two properly spaced ventilators 41, 42 installed near the air shafts 121, 122 with the possibility of two more ventilators 43, 44 placed in the middle part of the kiln compartment 1 equiped also with heating elements 430, 440.

Under the top and air deflector 3 is in the space between the bottom 101 and system vent 111 and the wall respectively the loading doors 11 and the rest of

the kiln volume 6 do offer enough large kiln volume that loading of at least one or more carriages with stacking units 5 is possible on which is stacked wood or other materials intended to be dried. In accordance with the principle of the invention will all details considering position 5 be explained as following.

In the drying device there is also installed at least one ventilator unit 7 consisting of at least one ventilator 71 with the ability of angular dispersion 72 of the current air flow. In position when ventilator is arranged parallel to adjacent side wall of the kiln compartment 1 is in inactive state and - vice versa - when being swung in another position it is in the active state. Ventilator has to be swung in its inactive state e.g. when the carriages 5 are moved along the kiln volume 6 for whatever the reason. Two ventilators 71', and 71" as shown in the Fig. 3 are separately arranged on appropriate supports 72', 72" each at the one side of the longitudinal side walls 13, 14 of the kiln compartment 1.

The carriage stacking unit 5 for wood as shown on Fig. 9 is equipped by wheels and foreseen for placing into the kiln volume 6. The carriage stacking unit 5 is in accordance to the invention constructed in such a way that it enables stacking the wood in a vertical position with the help of vertical distant elements 51 that also enable vertical stacking 52 with ensuring stacking through the width in specific degree. At least one stacking unit 5 is equipped by wheels 50 on Fig. 4 with the recommendation of having more stacking units. In this way it is possible to mount one on each other separate stacking units 5 equipped by wheels 50 to the required height. In this way as schematically shown on Fig. 5 and 7 is achieved stacking in vertical and horizontal direction in the required value through out the kiln volume 6 what consequently ensures good air permeability.

According to the invention it is most suitable to choose stacking of wood in the kiln volume 6 on the stacking units 5 in a way to achieve that dominant surfaces of wood are arranged in a vertical plane. Parts of wood of smaller width needs to be stacked in the stacking unit 5 by being put one on each other in a vertical position with ensured air gap distance between the wood by means of appropriate distance element 51'.

In accordance with the invention is moreover in the kiln compartment 1, more exactly in the area 10', a UV-radiation device 8 is mounted, which is preferably an emitter of ultra-violet and is foreseen for emitting of UV-rays to the moisture contained in the air with the intention of eliminating the possibility of development cultures like mould, fungi and other microorganism.

In the kiln compartment 1 in the area 10' there are furthermore available at least two magnets 9 in bipolar arrangement where magnetization treatment influences on all processes – chemical, physical and biological and on properties of all moisture that is present in the kiln volume 1.

In accordance with the invention the drying device on Fig. 4 and 5 enables an integrated drying process of dehumidification by condensation-convection method in a way as explained before. The wood intended to be dried is put into kiln volume 6 by opening loading lifting doors 11 on staking units 5 on which is properly staked wood with accessories 51, if needed also with vertical distance elements 51' and horizontal distance elements 52. A thin layer of wet substance stuck to rough surface of sawn wood is present on wood in this phase preventing further lossing of moisture content from wood. After the wood is put in the kiln volume 6 and the doors 11 closed the process of drying is started by activation of ventilators 41, 42, 43, 44, ventilation unit 40, ventilator 25 attached to the heat condensation unit and activated ventilators 71. The system vent 111 assembled in the wall respectively the door 11 is closed. The heat condensation unit 2 is activated and appropriate air

circulation is generated on a preset temperature value achieved by activating heating elements 430, 440 of the ventilation unit 40. When the conditions correspond to those as required, the heating elements 430, 440 are deactivated and the required heat may be supplied only with activated heat condensation device 2. With the intention of acceleration of the drying process appropriate circulation of suitable warmed up air has to be established. When moisture present on/in the wood is absorbed by the air it is lead through the heat condensation device 2 where it is eliminated with the help of condensation unit 21 as shown in the Fig. 8 and thereafter led out of the device by means of the escape pipe 201. In this phase can the kiln compartment 1 be connected with external air by means of air shafts 121 and 122. When passing trough the heat condensation device 2 the air is warmed up to a certain degree and sucked by ventilators 25 and 41, 42, 43, 44 in a circulating movement trough the tunnel shaped air shaft 1000 where it is heated up if necessary by means of appropriate heating elements 430 and 440 threafter it passes trough the passage 30 and by the system vent 111 and air deflector 3 entering in the kiln volume 6 where it is lead by ventilators 17 depending on the configuration of the wood that is stacked on carriage stacking units 50.

The drying conditions enable an intensive transfer of moisture from wood to the circulating air. Through the air shaft 122 the air emerges from the kiln volume 6 and the kiln compartment 1 outwards to the external atmosphere. As it is known from the science, the coller air enriched with moisture has downstream tendency, in this case therefore towards the bottom 101 of the kiln compartment 1. However, due the pressure difference is simultaneously the emerged air through the air shaft with the help of micro climate vent 1211 replaced by fresh air containing less moisture through the air shaft 121.

The rest of the air available in the kiln volume 6 passes trough the heat condensation unit 2 where moisture from the air is released by the help of condensing unit 21 and partially dried and heated up by means of the heating

unit 22 to the desired degree emerges entering the tunnel air shaft 1000 with the help of all ventilators starts a new circulating cycle by entering into the kiln volume 6. The drying mode as described enables especially at the beginning when a lot of free water is present on the wood and in it an efficient way to dry wood without heating it up to high temperature causing possible drying defects known by drying in the past.

In order to achieve pre-defined and controlled value of air moisture with the above described drying technology in the kiln compartment 1 and the kiln volume 6, now the drying conditions have to be changed. As it is known, the wood contains capillars in cells that contain free liquid and absorbed molecules of water called moisture content which by being lowered if applying the right drying technology must be executed in the proper climate conditions depending mainly on the kind of wood and varying essentially from kind to kind, where circulating air should always be capable of reducing moisture content, constantly emerging from the drying wood.

In the above mentioned way it is possible to execute drying in a simple and surprisingly short time by the new developed drying device in kiln volume 6 without engaging accessories of any kind and restaking processes of wood and without additional heating of air. The air passes through the passage 30 near the air deflector 3 and the system vent 111 is opened as shown on Fig. 6 and 7 in consideration that in most cases additional heating of air is not needed, even functional exterminated the implementation of the new developed drying process can be executed. The micro climate vent 1211 and the air shafts 121 and 122 are by implementation of new developed drying manner in their closed position.

Therefore, according to the invention, the difference comparing to known solutions of drying processes is physical prevention of repeated circulation and mixing of dry and saturated air what would cause low efficiency. The

activated ventilators 41, 42, 43, 44 of the venting unit 40, ventilator 25 of the heat condensation device 2, and ventilators 71 generate appropriate air circulation. The external air led into the kiln compartment 1 and consequently into the kiln volume 6 passes through the system vent 111, which is opened, and is thereafter led through the kiln volume 6 and through a self-adjustable vent 31 and after that through the heat condensation device 2 containing heating unit 22 is mostly or even permanently functionally exterminated but with the help of ventilator 25 is led through the tunnel-shaped air shaft 1000 to the air passage 30. When the system vent 111 is in the opened position the air emerging from the air passage 30 cannot reenter the kiln volume 6 but is exhausted from the kiln compartment 1 to the external atmosphere. In this way it is achieved that only a dry fresh air has the ability to get in contact with the drying wood. Those skilled in the art should understand that the intaken fresh air would have to be treated in certain ways in cases of extreme climate conditions what can be done with the help for this meant accessories what does not influence on the principle of the invention.

PATENT CLAIMS

1. A drying device, which is created on the basis of many ventilation air systems arranged in a kiln compartment (1) and equiped by a heat condensation device (2) comprising a condensation unit (21) and a heating unit (22), and with at least one ventilator (25), with a kiln volume (6) as well as with at least one loading door (131) in a kiln compartment (1) where wood or other material for drying is placed with the help of carriage staking units (5) with gradual absorption of moisture content in the wood to the circulating air available in the said kiln compartment (1) and particularly in the said kiln volume (6), characterized by that at least one wall (11), which may also be arranged as a door, is equipped by a system vent (111), which in sense of functional leading of air flow for performing and monitoring the kind of drying mode in kombination with an air deflector (3) placed above the kiln volume (6) in the kiln compartment (1) with the heat condensation device (2) ending in a certain distance from the another side wall (12) of the kiln compartment (1) close to the bottom (101) of the kiln compartment (1) to which also extends the said air deflector (3) close to the heat condensation device (2) equiped at least with one self-adjusting vent (31) and air deflector (3) extending over the kiln volume (6) to the top (101) of the kiln compartment (1) in a direction towards the system vent (111) and the air passage (30) between the air derflector (3) and the said system vent (111) assembled in the wall respectively the door (11) of the kiln compartment (1) formed tunnel shaped air shaft (1000) in which is placed appropriate ventilation assembly (40).

2. Drying device according to Claim 1, characterized in that both aerating and exhausting shafts (121, 122) are equiped by one and the same micro climate vent (1211) arranged adjacent to the wall (12) of the kiln compartment (1), next to which near to the air deflector (3) a heat condensation device (2) is

arranged, so that from the kiln compartment (1) one air shaft (121) extends to the exterior atmosphere under the top (100) of the kiln compartment (1) and the second air shaft (122) which extends to the exterior above the bottom (101) of the kiln compartment (1).

3. Drying device according to Claims 1 and 2, characterized in that in the kiln volume (6) is placed at least one additional ventilation unit (7) comprising at least one ventilator (71) placed on an adjustable support (72) enabling angular dispersion of air flow with the ability of putting it in off mode if placed parallel to the side wall or in position on mode if placed unparallel.

4. Drying device according to Claim 1, characterized in that the system vent (111) is arranged the wall respectively the door (11) of the kiln compartment (1) in such a manner that in its closed position is enabled internal circulation of the air flow from the tunnel-shaped air shaft (1000) in the area between the top (100) of the kiln compartment (1) and the air deflector (3) passing through the air passage (30) between the air deflector (3) and the wall respectively the door (11) into the kiln volume (6) in a direction towards the self adjustable vent (31) and under the air deflector (3) towards the heat condensation unit (2), since in the case when the system vent (111) is opened the air flow is passing from the tunnel shaped air shaft (1000) through at least two gaps formed by opening the system vent (111) the air is blown out of kiln compartment (1) in open space on the upper side through at least one gap and simultaneously the fresh air is sucked from outside directly into the kiln volume (6) through at least one lower gap.

5. Drying device according to Claim 1, characterized in that at least some of ventilators (41, 42, 43, 44), which are arranged in the tunnel-shaped air shaft (1000) available between the air deflector (3) and the top (100) of the kiln compartment (1), are equipped by appropriate heating units (430, 440) provided for complementary heating the air in the tunnel shaped air shaft (1000).

6. Drying device according to Claim 1, characterized in that the carriage staking units (5) intended for displacement of drying material, particularly wood, is equipped not only with vertical distance elements (51), but also with horizontal distance elements (52) .

7. Drying device according to Claim 6, characterized in that at least some of the carriage staking units (5) are equipped by wheels (50) ensuring their mobility.

8. Drying device according to Claim 6 and/or 7, characterized in that the carriage staking units (5) can be put one on each other by means of the vertical distance elements (51).

9. Drying device according to Claim 1, characterized in that the heat condensation unit (2) comprises at least a condensation unit (21) and a heating unit (22).

10. Drying device according to Claim 9, characterized in that the heat condensation device (2) in its housing (20), which is equipped with an escape pipe (201) for leading out the condensate, near to the condensation unit (21), the heating unit (22), a the compresor (23) and a throttle (24), which are bound to appropriate circuit, also comprises a ventilator (25).

11. Drying device according to Claim 1, characterized in that the kiln compartment (1) is constructed on the base of a standard container fulfilling dimensional standards for international container transports.

12. Drying device according to Claim 1, characterized in that the vent (31) of the air deflector (3) is self-adjustable.

13. Drying device according to Claim 1, characterized in that in the interior of the kiln compartment (1) a radiation device (8) is placed close to the venting and exhausting shafts (121,122).

14. Drying device according to Claim 13, characterized in that the radiation device (8) is preferably an emitter of ultra-violet rays.

15. Drying device according to Claim 1, characterized in at least two magnets (9) are arranged in the kiln compartment (1).

16. Drying device according to Claim 15, characterized in that at least two permanent-magnets (9) are arranged in the interior of the kiln compartment (1).

17. Drying device according to Claim 16, characterized in that in the interior of the kiln compartment (1) a bipolar magnetic field is available by means of at least two permanent-magnets are arranged adjacent to the exhausting and aerating shafts (121, 122) and the air deflector (3).

18. Drying device according to Claim 6, characterized in that the distance between neighbouring vertical distant elements (51) - observed in a horizontal direction - are always shorter than side vertical supports (52).

19. Drying device according to Claim 6 and 18, characterized in that the staking unit (5) aside vertical distance elements (51) predicted use of horizontal distance elements (51') for ensuring proper air gap respectively certain distance between wooden elements put one on each other in a vertical direction between vertical distance elements (51).

20. Drying device according to Claims 1 and 2, characterized in considering microclimate vent (1211) functioning in combination with air shafts (121,

122) which is in case of increased moisture value activated on the top of kiln compartment (1) and is connected with the kiln volume (6) through the air shaft (122), where air is blown out, but by the help of air shaft (121) in case of pressure differences fresh outside air is sucked into the area (10'), but when the microclimate vent (1211) is unactivated is the drying process isolated from external atmosphere air and internal air circulation is generated in the kiln compartment (1).

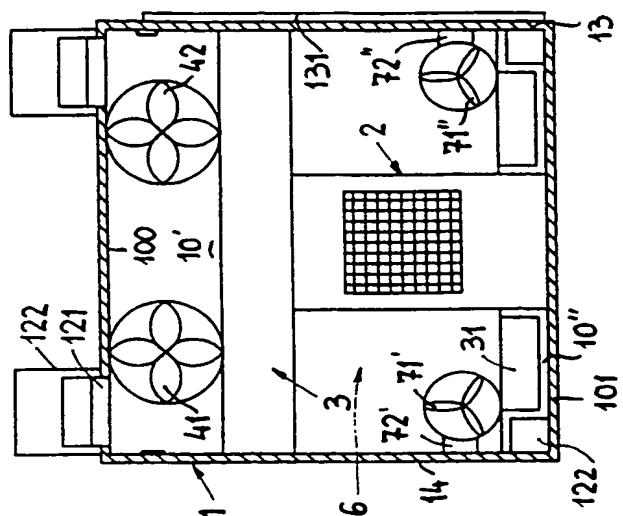


Fig. 2

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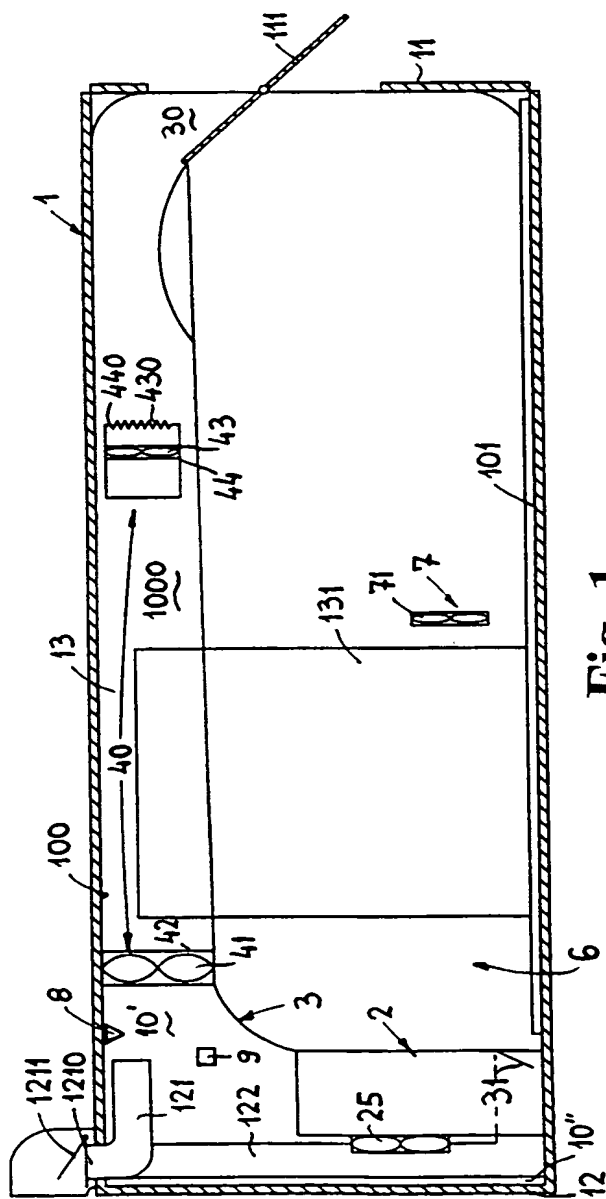


Fig. 1

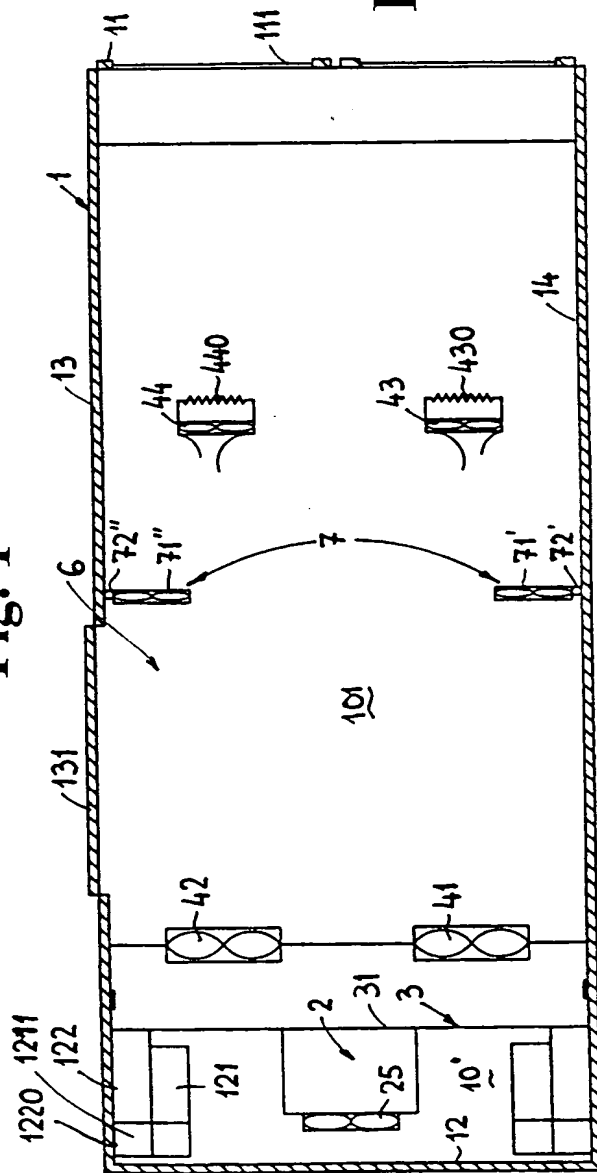


Fig. 3

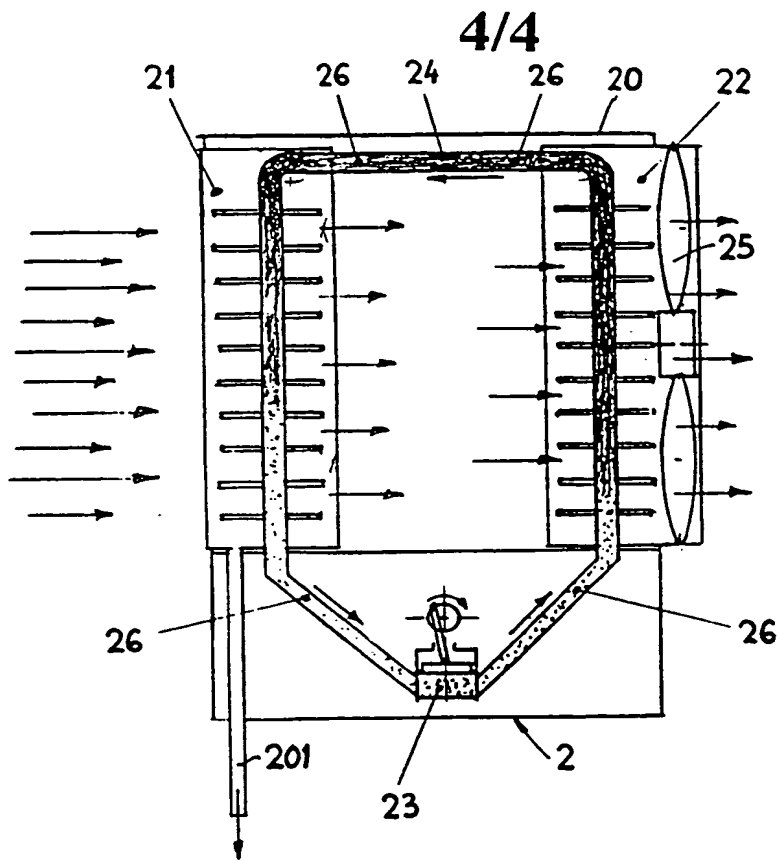


Fig. 8

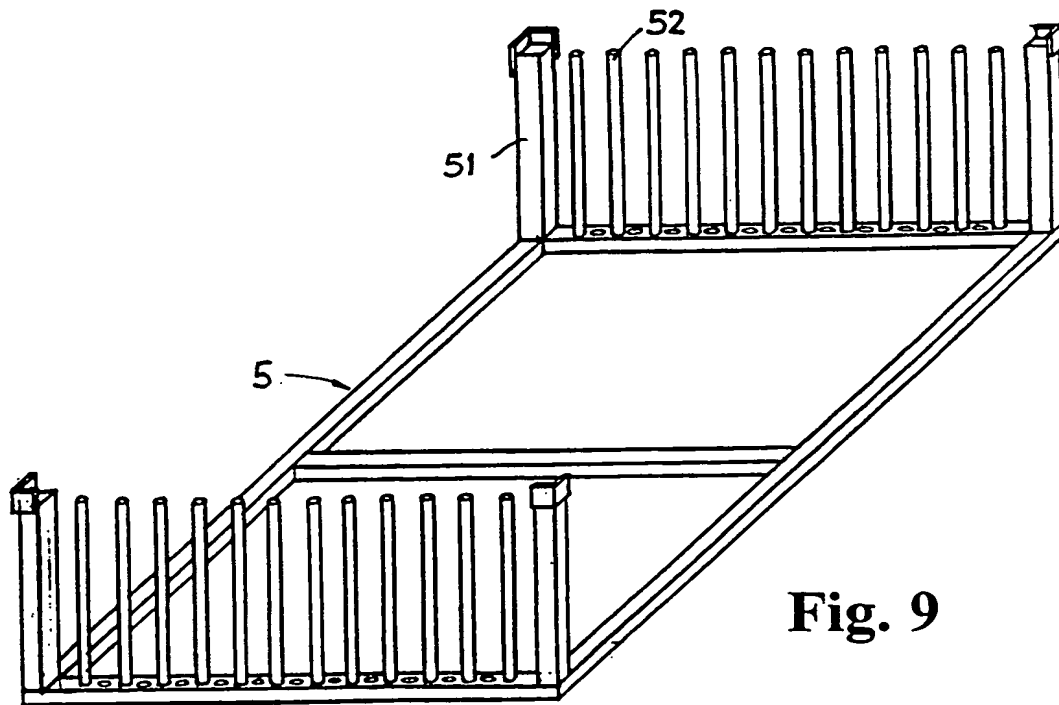


Fig. 9

INTERNATIONAL SEARCH REPORT

National Application No
PCT/SI 98/00008

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F26B21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F26B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 644 855 A (C.E.A.F.) 28 September 1990 see the whole document ---	1,5,9,10
A	CH 585 379 A (FELBER) 28 February 1977 see the whole document ---	1,9,10
A	EP 0 170 648 A (LEISSER) 5 February 1986 cited in the application see the whole document ---	1,9
A	DE 24 41 855 A (JÖRGENSEN) 11 March 1976 see the whole document ---	1,2,4,5
A	US 3 566 480 A (JOHNSTONE) 2 March 1971 see the whole document ---	1,4,5
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 June 1998

Date of mailing of the international search report

25/06/1998

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/SI 98/00008

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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